

the laser energy breached the subchondral bone. Additional wavelengths continue to be investigated and may provide additional cutting instrumentation in the future. Any new laser instrumentation must be economically feasible, however, to be accepted within the orthopedic community.

Photochemical techniques have also been recently adapted for treatment of rheumatoid arthritis. Photodynamic therapy is the destruction of pathologic tissue with light-activated photosensitizing chemicals, which selectively accumulate in the target tissue. Multiple chemicals are currently under development for the percutaneous and transcutaneous treatment of inflammatory synovium. Most light activation techniques incorporate use of low-energy laser devices. Although not actively in clinical use at this time, pre-clinical animal studies have shown promising results with both transcutaneous and fiberoptic percutaneous techniques.

Over the next several decades, we will most likely see the emergence of new light and optically based technologies for the treatment of musculoskeletal disease. While lasers will continue to be used as cutting devices, most advances will occur in areas of photochemistry and applied optics.

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#### REFERENCES

- Imhoff AB. The use of lasers in orthopedic surgery. *Operative Techniques in Orthopedics* 1995; 5(3):192-193
- Sherk HH. Current concepts review: the use of lasers in orthopedics procedures. *J Bone Joint Surgery* 1993; 75:768-776 (Abstract)
- Trauner KB, Hasan T. Photodynamic treatment of rheumatoid and inflammatory arthritis. *Photochemistry and Photobiology* 1996; 64:740-750

## Brachial Plexus Palsies in Neonates

THE INCIDENCE of brachial plexus palsy after delivery remains 0.5 to 1 per 1,000 live births. The severity of the palsies, however, has decreased. Brachial palsies are most common in large babies, but they have even been seen in children delivered by Cesarean section. Most initial examinations show a completely flail upper extremity, but 70% to 90% of these palsies fully resolve. Unfortunately, there is no clear clinical or even laboratory measure that gives a sense of prognosis. Many children with no elbow function at 3 months develop it by 12 months to 18 months and then have a complete resolution of the palsy. Thus, whether to perform an exploration with nerve grafts or transplants at ages 3 months to 6 months is still debatable.

The initial management of these children should involve a complete range of motion of all digits and joints in the upper extremity. The goal is to start rehabilitation immediately. The exception is when the shoulder is painful because of an associated clavicle fracture or bleeding or swelling into the posterior triangle of the neck. In these patients, vigorous activities involving the

shoulder would be inappropriate and should therefore be delayed for two weeks.

External rotation shoulder exercises are the most difficult to get families to do. In these exercises, it is not good enough just to abduct and rotate externally; therefore, the family should be instructed how to rotate externally with the arm against the chest. Families may need a demonstration of these exercises by a therapist, and the family need to meet with the therapist on a weekly basis, at least in the beginning. The success rates of electrical stimulation and other biofeedback types of therapy are unproven.

Despite therapy, two anatomical problems may gradually and progressively occur: the dislocation of the radial head, either anteriorly or posteriorly, and the dislocation of the humeral head, posteriorly. Because these possibilities exist, children who have persistent loss of motion should have roentgenograms of the elbow and the shoulder, including an axillary view, to rule out dislocations.

Residual disability of these children is difficult to clearly define in the first few years of life. New muscles can develop up to age 18 months and weak muscles can become strong enough to be considered normal up to age 4 years. None of these neonatal palsies results in a completely flail extremity. The most common residual, which was first described by Erb, involves weakness of shoulder abduction and external rotation with some weakness of elbow flexion, which may result in the posterior dislocation of the shoulder. We now know that this residual is best managed by a release of the internal rotators of the shoulder and a transfer of the latissimus dorsi and teres major about the shoulder to create external rotators. The elbow in children with an Erb's palsy may develop pronation flexion contractures that may even cause dislocation of the radial head posteriorly. We have recently learned that nothing should be done for these contractors, because they actually give the patient an advantage in flexion.

A rarer residual picture is that of a posterior spinal cord syndrome in which all the muscles enervated from the posterior cord nerves are paralyzed; this gives rise to weak abduction in the shoulder, extension of the elbow, and extension of the wrist and fingers. In these instances, transfers of the wrist flexors to finger extensors and an eventual glenohumeral fusion will improve function. Another rare outcome is that of the palsy of the muscles in the hand as first described by Klumpke, usually in children born breech with a stretch of the C-8 and T-1 nerve roots. Very few operative procedures will help these children, but the palsies can occasionally be bilateral and require a bracing system for children to function.

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#### REFERENCES

- Phipps GJ, Hoffer MM. Latissimus dorsi and teres major transfer to rotator cuff for Erb's palsy. *J Shoulder Elbow Surg* 1995; 4:124-129
- Waters PM. Obstetrical brachial palsy injuries: evaluation and management. *J Am Acad Ortho Surg* 1997; 4:205-213